

N O T I C E

THIS DOCUMENT HAS BEEN REPRODUCED FROM
MICROFICHE. ALTHOUGH IT IS RECOGNIZED THAT
CERTAIN PORTIONS ARE ILLEGIBLE, IT IS BEING RELEASED
IN THE INTEREST OF MAKING AVAILABLE AS MUCH
INFORMATION AS POSSIBLE

NASA-CR-160920

LANDSAT RANGE RESOURCE INFORMATION SYSTEM

By

W. E. Boyd, Project Manager
J. Clifford Harlan, Principal Investigator



Final Report for Period
October 1979 - January 1981

(NASA-CR-160920) LANDSAT RANGE RESOURCE
INFORMATION SYSTEM Final Report, Oct. 1979
- Jan. 1981 (Texas A&M Univ.) 25 p
HC A02/MF A01

N81-21445

CSCD 05B

Unclass

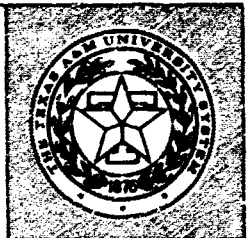
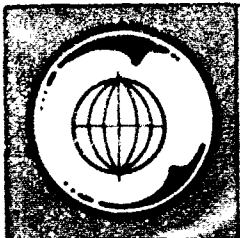
G3/43 41459

Prepared for

National Aeronautics and Space Administration
Johnson Space Center
Houston, Texas 77058

Contract No. NAS9-15468

TEXAS A&M UNIVERSITY
REMOTE SENSING CENTER
COLLEGE STATION, TEXAS



LANDSAT RANGE RESOURCE INFORMATION SYSTEM

By

W. E. Boyd, Project Manager
J. Clifford Harlan, Principal Investigator

Remote Sensing Center
Texas A&M University
College Station, Texas 77843

Final Report for Period
October 1979 - January 1981

Prepared for
National Aeronautics and Space Administration
Johnson Space Center
Houston, Texas 77058

Contract No. NAS9-15468

A series of test products were developed from data sets for North Central Texas that paralleled the needs of ranchers, technical personnel and the media. These needs are enumerated in RSC 3697-4 (Chilton et al., 1978). The products were mailed to approximately 150 ranchers who had reported an interest in evaluating new information systems. In addition to the rancher group, fourteen media people were sent samples of the products. A thirty-three member group in the agri-business/technical community was also chosen to receive test products. Examples of the test products and associated questionnaires are included for reference in Appendix A.

Ranchers

Of the approximately 150 ranchers queried, 53 returned the questionnaires. Figure 1 illustrates the distribution of the replies by acreage size class. The ranchers were asked to evaluate two test products. One was a series of three contour maps showing the total accumulated rainfall for periods of 30, 60 and 90 days prior to August 8, 1975. The other was a map showing the increase or decrease in green forage (grass & forbs) in pounds per acre for the period from June 15 to August 8, 1975. Both products referenced the same area in North Central Texas.

Rainfall - The first question asked for a ranking of the value of rainfall information to the rancher's particular operation. Ninety-four percent (48/53) of the replies ranked rainfall information either moderately (23.5%) or highly (40.6%) valuable.

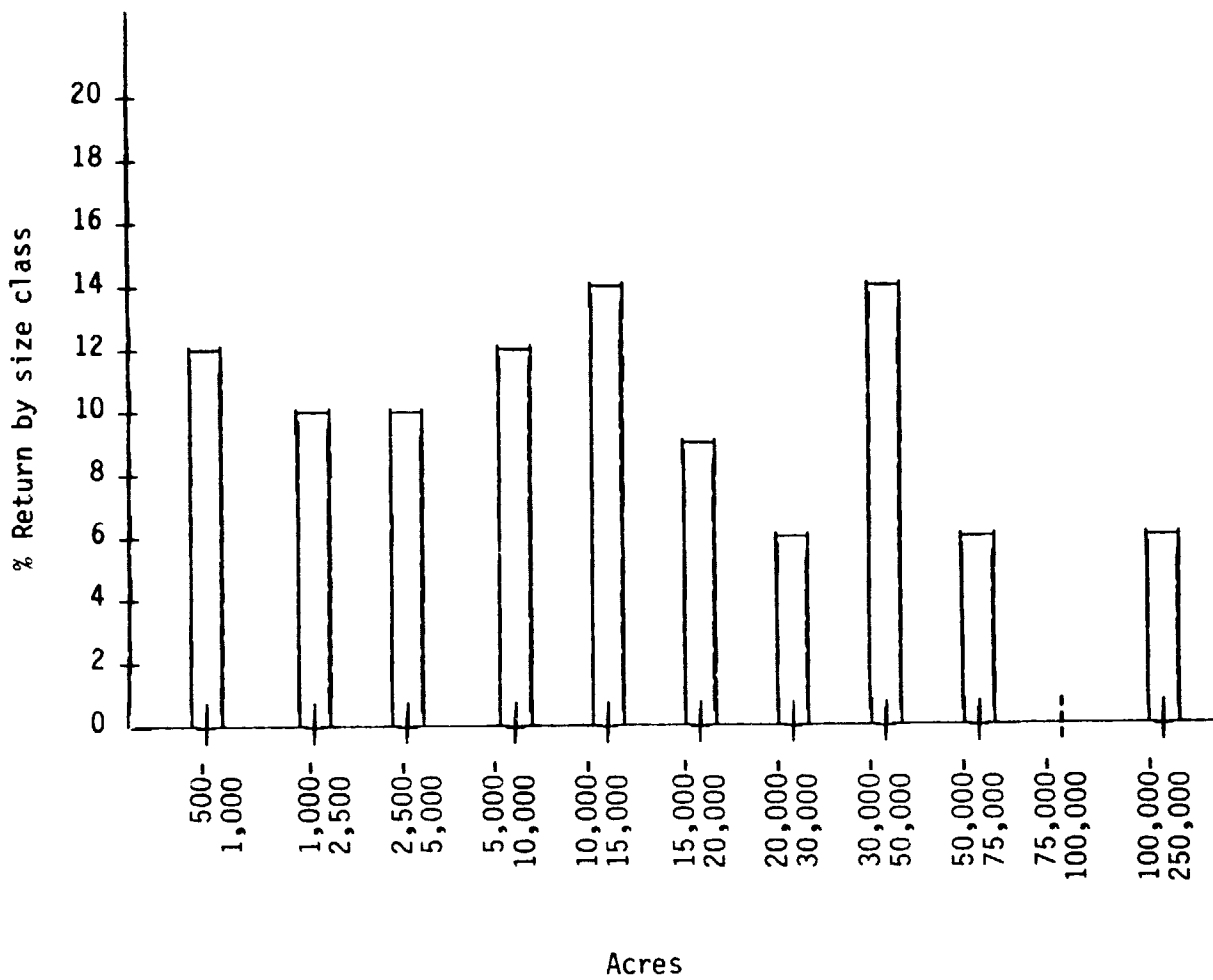


FIGURE 1: Questionnaire replies by acreage class.

Question two inquired for which time period (30, 60, or 90 days) rainfall information would be of most value in forecasting green forage production. The 30 day period drew the highest response (41%) followed by 60 and 90 days (25% each).

Only 22% (12) of the rancher replies came from ranches within the product coverage area. Eighty-two percent of those ranchers thought there were sufficient landmarks to locate their general area. The 17% who found the landmarks insufficient suggested such improvements as adding county seat names, mapping a larger area or adding more major highways.

The 41 ranchers (77%) whose operations were not in the map area were asked if a map of similar style and accuracy for their locations would be of value. Ninety five percent replied in the affirmative.

Questions 4, 6 and 7 dealt specifically with the information content of the maps. Question 5 dealt with the clarity of the material. Ninety-three percent of the ranchers found the material either highly (56%) or moderately (37%) understandable.

In question 6, 91% of the respondents said it was very easy (55%) or moderately easy (37%) to determine the rainfall received in a specific area. When asked to determine the specific amount of rainfall at a specific spot (Stamford), 88% chose the correct amount (2 to 3 inches).

Question 8 inquired about improvements to the map for clarity or value. The responses suggested: adding landmarks, 37%; adding more detailed rainfall, 29%; reducing the area of coverage, 12%; enlarging the area of coverage, 25%. Other suggestions included using color codes, county names and seats, and placing all three maps on the same sheet.

The respondents preferred to receive the information by direct mail (79%, 41/52), radio (31%, 16/52) and magazines (29%, 15/52).

Eighty-six percent of the respondents thought current rainfall information would be either highly (51%) or moderately (35%) valuable.

Green Forage - A similar set of questions were asked about the forage maps. Eighty percent of the respondents' operations were not in the area of map coverage. Of the respondents whose area was covered, 83% felt there was sufficient detail on the maps. The modifications most frequently asked for included adding county names and seats and more highways. For those not covered in the map area, 95% (41/43) would like similar format maps for their own areas.

Questions 3 through 5 were concerned specifically with the forage data. Question 3 inquired as to the clarity of the data. Eighty-six percent (44/51) thought the data either moderately (51%) or highly (35%) understandable. Question 4 queried the ease of determining the amount of green forage in a specific location. Eighty-two percent (42/51) said they found the data either moderately (43%) or very easily (39%) determinable. When asked to find the amount of forage at a specific site, 79% checked the proper response. The most common error was a sign change (- for +), where (-) indicated a decrease in forage and (+) indicated an increase.

Questions 6 through 8 concerned the format and availability of the data. When asked about changes in format to improve clarity or accuracy, 40% (21/52) asked for more landmarks and 35% (18/52) asked for more detail. The respondents to question 7 prefer monthly (66%)

or quarterly (16%) data availability and seem to favor direct mail (41/52), magazines (13/52) and newspapers (12/52) as the method of reception.

Eighty-six percent of the respondents to question 9 thought this type of information to be very (38%) or moderately (48%) valuable in managing their respective operations.

Technical Personnel

Evaluation of the test products by technical personnel produced trends similar to those of the ranchers. In addition to the rainfall and forage contour maps this group also received a regional vegetation type map.

The group of 33 people who were asked to evaluate the products consisted of two commodities specialists, six lending institution representatives, six SCS personnel, three resource consultants, two ranchers, seven university personnel, a recreational land leasing organization representative, five professional land managers and the Remote Sensing staff of the Texas Parks and Wildlife Department. The level of replies from this group averaged about 55%.

Rainfall - Replies concerning the rainfall maps will be considered first. Rainfall information was considered highly valuable (8/15) or moderately valuable (3/15) by 73% of those replying. The most frequently specified time period for data was 30 days (7/15) with 6 of 14 replies asking for an update biweekly.

Fifty-five percent of those replying to question 4 were not in the area of map coverage. Sixty-three percent of those that were

covered felt that the maps contained sufficient detail. Of those not working in the area, 85% would like to have similar maps for their respective areas.

Questions 5, 6 and 7 dealt with the ability to obtain data from the map. All of the respondents (15) found the map either highly or moderately understandable. Eighty-seven percent could determine the rainfall received in a specific area very or moderately easily. All fifteen respondents read the map correctly for the rainfall amount at Stamford for the period 30 days prior to August 8.

When asked about improvements regarding clarity or value, four asked for more landmarks, three for more rainfall information, five wanted a reduced area of coverage, and five wanted an enlarged area of coverage. Several checked more than one response and other comments requested historical averages for the reporting period and/or year.

Preferred placement of the data, ranked in order of response, were: direct mail 9, newspapers 6, and magazines 2. Other methods suggested were placement at the local SCS and Extension Service offices.

Forty-three percent (7/15) thought current rainfall information to be of moderate or high value.

Green Forage - Fifty-five percent of those replying to the questionnaire were in the map area. Half thought there were sufficient landmarks to locate their general area. Of those not covered by this map, 70% would like a map of similar format and accuracy for their areas. Eighty-five percent found the map forage information either highly or moderately understandable. Seventy-six percent found it very or moderately easy to determine the amount of green forage in a

specific area. When asked to interpret the map, eighty-seven percent checked the proper response.

When queried about improvements concerning value or clarity, six respondents asked for more landmarks, four for more detailed information, six for reduced coverage and three for enlarged coverage. Other comments from respondents asked for more highways and county names and seats.

The most common reporting frequency asked for was monthly, followed by quarterly and biweekly. Most respondents wanted the information by direct mail (9/15) or newspaper (6/15). Other sources for receiving the information included the local SCS or Extension Service. Eight of 13 found the information to be either very or moderately valuable for managing their operation.

Regional Vegetation Map - Seventy-four percent of the respondents did not operate in the area covered in the sample products. Of those covered, most (3/4) found their areas of interest identifiable. For those not covered (14), 70% would like a map of a similar type for their areas. Less than half (44%) thought there was sufficient geographic detail. Suggestions for additional detail included highways and towns (5), larger scale (2) and county seats and lines (2).

Data transmission preferences were direct mailing to: business address (9/13), county SCS office (7/13), and county agent (3/13). Seventy percent would be willing to pay at least \$10 for a map of this type.

EVALUATION OF A MAP SHOWING THE CHANGE IN THE AVAILABILITY OF GREEN FORAGE

The attached map for an area in North Central Texas shows the increase or decrease in green forage (grass + forbs) in pounds per acre from June 15 to August 8, 1975. Negative numbers (and dashed lines) mean less green vegetation in August than June. Positive numbers (and solid lines) mean more green vegetation in August than June. 0 indicates no change. The map shows an area approximately 150 miles long and 150 miles wide. Please evaluate the map as if it were current information and complete the questions below. Your response will help us determine the value of this type of information to you and other ranchers in West Texas.

NAME _____

ADDRESS _____

TYPE OF OPERATION _____ SIZE (ACRES) _____

1. Is the location of your operation covered by the attached map? Yes _____ No _____
 If yes, are there sufficient landmarks (highways, lakes, towns) on the map for you to locate your general area? Yes _____ No _____
 If the landmarks are insufficient, what others should be added? _____

2. If your ranch location is not shown on this map, would a map of the same format and accuracy covering your operation be valuable?
 Yes _____ No _____

3. Is the information on the availability of green forage understandable?
 Highly Understandable _____ Moderately Understandable _____ Slightly Understandable _____ Not Understandable _____

4. Can you determine the amount of green forage produced from June to August in a specific area?
 Very Easy _____ Moderately Easy _____ Easy _____ Not at all _____

5. Using the data on this map, approximately how much change in green forage was there immediately south of Lake Kemp?
 _____ 0 lbs/acre (no change)
 _____ 200-400 lbs/acre more _____ 200-400 lbs/acre less
 _____ 400-600 lbs/acre more _____ 400-600 lbs/acre less

6. What improvements should be made to the green forage map to improve the value or clarity? (you may check more than one)
 More landmarks _____ More detailed vegetation information _____ Reduce area of coverage _____
 Enlarge area of coverage _____ Other (please specify) _____

7. How often would you like to have similar vegetation information?
 Weekly _____ Biweekly _____ Monthly _____ Quarterly _____ Annually _____

8. Where would you like to see this information?
 Newspaper _____ TV _____ Direct mail on subscription basis _____ Magazines _____ Other (please specify) _____

9. How valuable would information like this be to you in managing your operation?
 Very Valuable _____ Moderately Valuable _____ Slightly Valuable _____ Not Valuable _____

Thank you for your assistance. The map is yours to keep. Please place the completed questionnaire in the enclosed self addressed postage paid envelope and place in the mail. You will be receiving a copy of the final report in a few weeks.

Summary

In general, the responses were pleasingly positive. Most respondents felt that they could use the data and could read it fairly easily, and a good number could interpret it correctly without prior instruction. Minor objections were raised about the kind and amount of detail. These problems appear to be easily solvable. Most who reviewed the vegetation maps would pay at least \$10 for them.

Specific points which should be emphasized are:

1. Most of those queried were outside the area of map coverage yet were still interested in a similar product.
2. Direct mail to the user is largely preferred. Only for the regional vegetation map was the Extension Service/SCS mentioned.
3. The media repeatedly emphasized rapid, timely transmission by the fastest possible means, with some local interpretation added.
4. Product frequency requested was thirty days for both rainfall and green forage.
5. Product preference broke along two lines: local, meaning very small area (county or less), and regional (several counties at least). At both scales, the amount of detail needed to be increased. At the small scale, more detailed product information and base geography were suggested. At the large scale, more county name and seat locations and major roads were requested.

BIBLIOGRAPHY

Chilton, H., J. C. Harlan and W. E. Boyd. 1978. Landsat Range Resource Information System Project. Remote Sensing Center Progress Report 3697-4, Texas A&M University.

APPENDIX A

EVALUATION OF RAINFALL MAPS

The attached maps for an area in North Central Texas show the amount of rainfall in inches that was reported during the periods shown on each map. Map #1 shows the accumulated rainfall for the 30 days prior to August 8, 1975, Map #2 shows the accumulated rainfall for the 60 days prior to August 8, 1975 and Map #3 shows the accumulated rainfall for the 90 days prior to August 8, 1975. The maps show an area approximately 150 miles long and 150 miles wide. Please evaluate the attached maps as if they were current information and complete the questions below. Your response will help us determine the value of this type of information to you and other ranchers in West Texas.

NAME _____

ADDRESS _____

TYPE OF OPERATION _____ SIZE (ACRES) _____

1. How valuable is rainfall information to your operation?

Highly Valuable _____ Moderately Valuable _____ Slightly Valuable _____ Not Valuable _____

2. The attached maps show accumulated rainfall for a 30, 60 or a 90 day period prior to a specific date. Which of these time periods would be most valuable to you in forecasting green forage production?

Less than 30 days _____ 30 days _____ 60 days _____ 90 days _____ More than 90 days _____

3. For the period you have checked above, how often would you like to have this information updated? For example, if you wanted a map showing the accumulated rainfall over a 30 day period published every two weeks, you would check (✓) 30 days in Question #2 and check (✓) biweekly in Question #3.

Weekly _____ Biweekly _____ Monthly _____ Bimonthly _____ Quarterly _____

4. Is the location of your operation covered by the enclosed maps? Yes _____ No _____

If yes, are there sufficient landmarks (highways, lakes, towns) on each of the maps for you to locate the general area of your operation?

Yes _____ No _____

If the landmarks are insufficient, what others should be added? _____

If your ranch location is not shown on these maps, would map of the same type format and accuracy covering your operation be valuable?

Yes _____ No _____

5. Is the rainfall information on the maps understandable?

Highly Understandable _____ Moderately Understandable _____ Slightly Understandable _____ Not Understandable _____

6. Can you determine the rainfall received in a specific area?

Very Easy _____ Moderately Easy _____ Easy _____ Not at all _____

7. Using the data on this map, approximately how much rain fell during the 30 days prior to August 8 at Stamford?

0 inches _____ 1 to 2 inches _____ 2 to 3 inches _____ 3 to 4 inches _____

8. What improvements should be made to the rainfall maps to improve their value or clarity? (you may check more than one)

More landmarks _____ More detailed rainfall information _____ Reduce area of coverage _____
Enlarge area of coverage _____ Other (please specify) _____

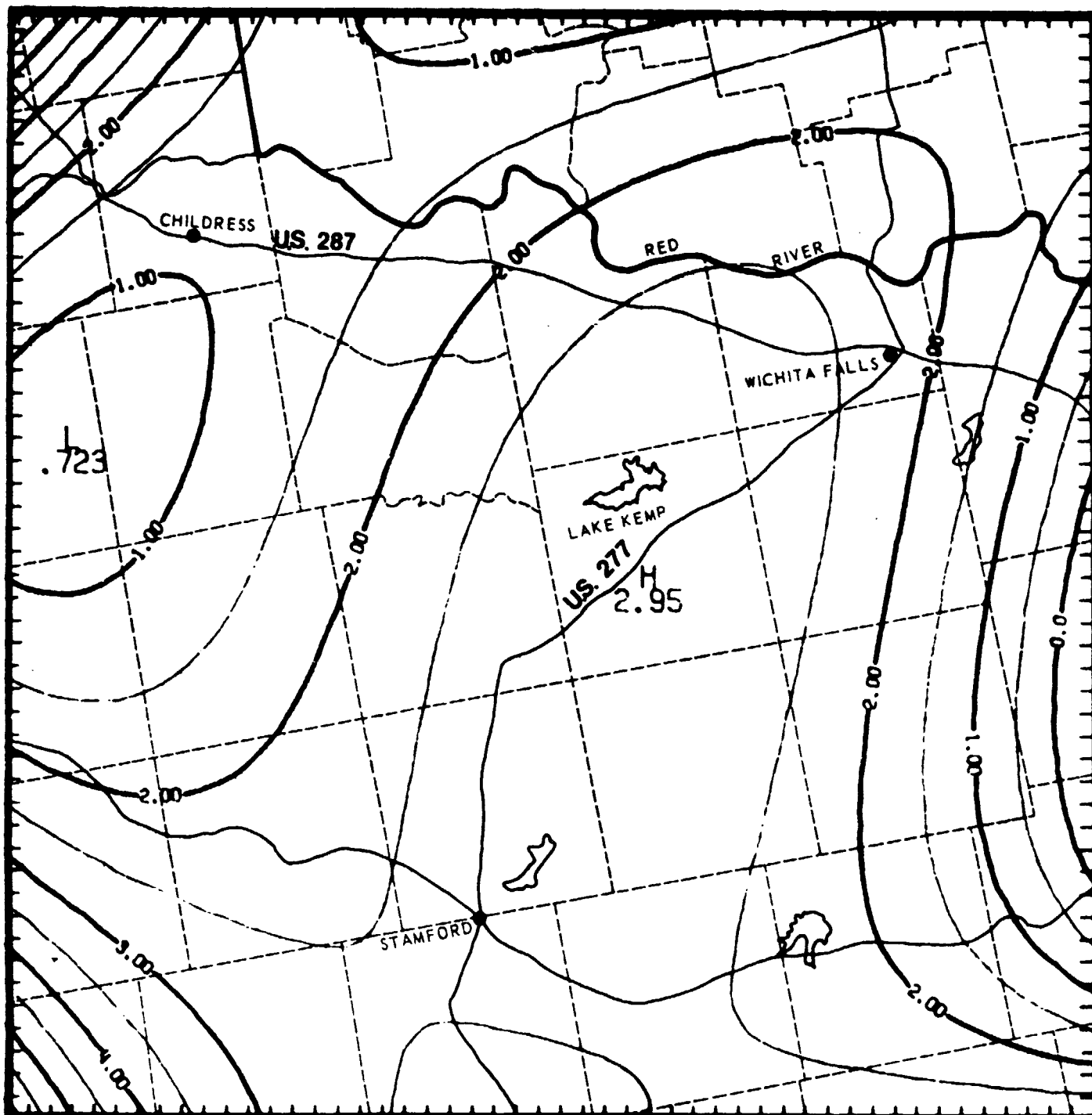
9. Where would you like to see this information? (you may check more than one)

Newspaper _____ TV _____ Direct mail on subscription basis _____ Magazines _____
Other (please specify) _____

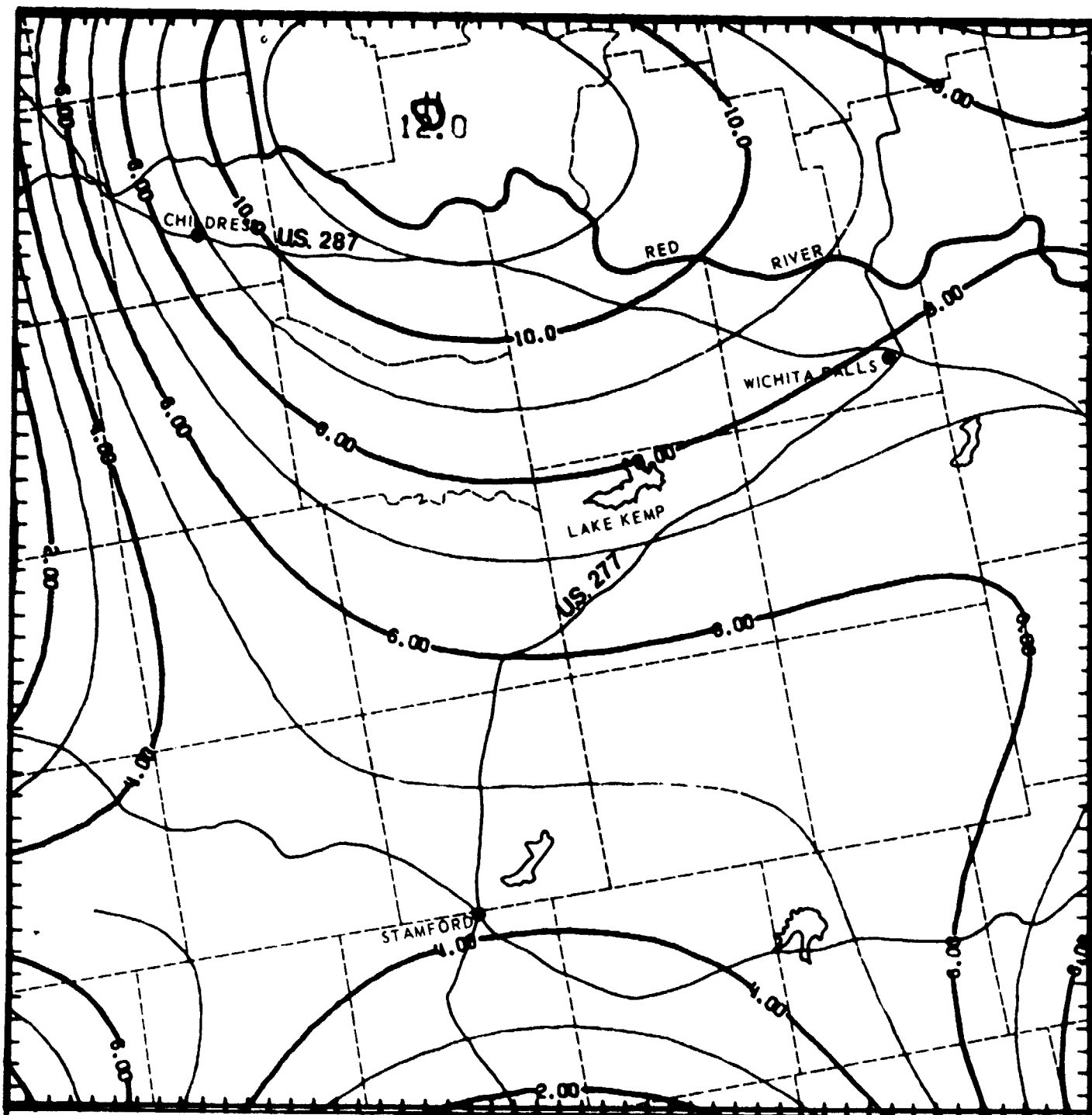
10. How valuable would current rainfall information be to you if it were presented on similar maps for your area?

Very Valuable_____	Moderately Valuable_____	Slightly Valuable_____	Not Valuable_____	No Opinion_____
-----------------------	-----------------------------	---------------------------	----------------------	--------------------

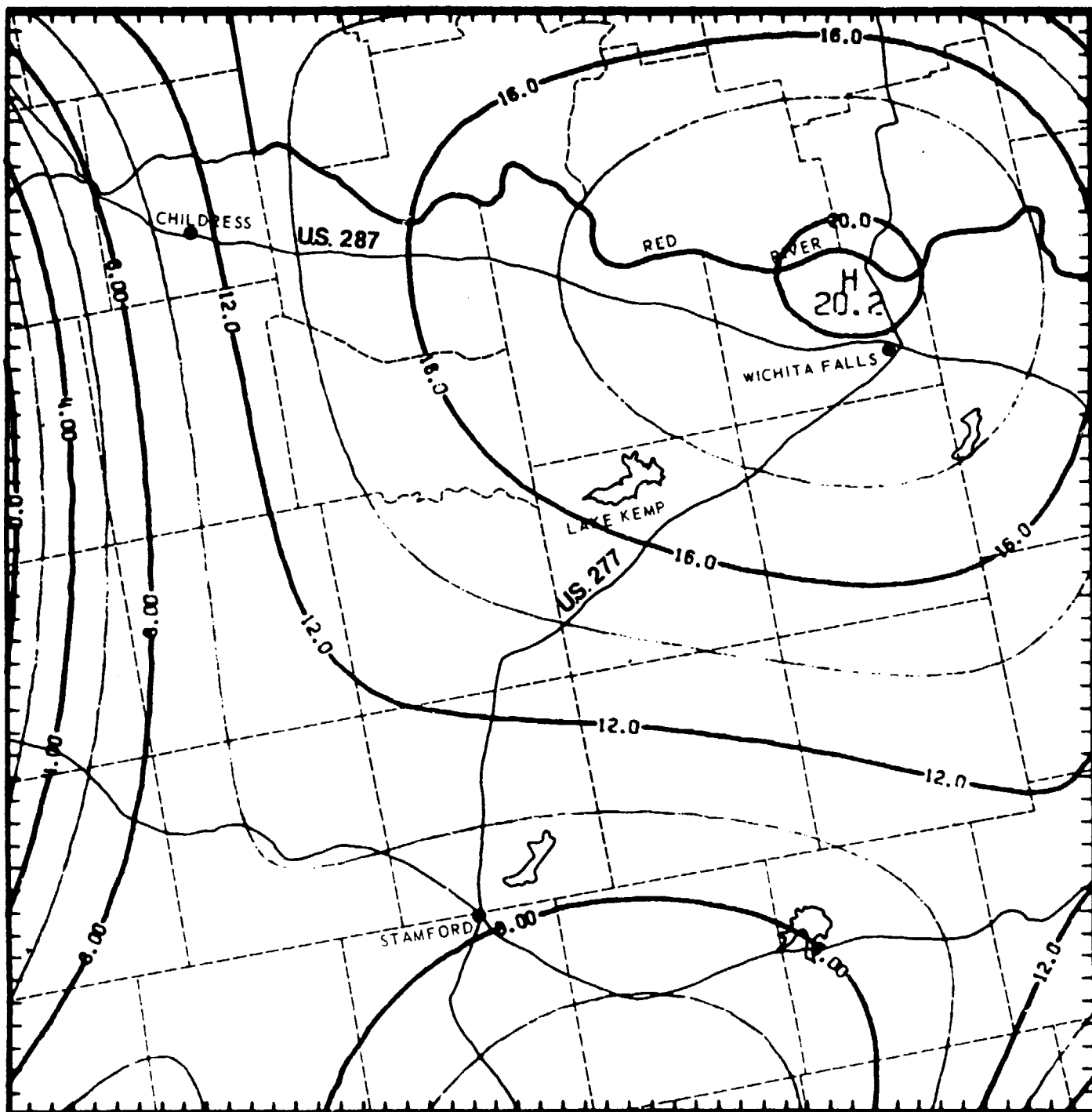
Thank you for your assistance. The maps are yours to keep. Please place the completed questionnaire in the enclosed self addressed postage paid envelope and place in the mail. You will be receiving a copy of the final report in a few weeks.



MAP 1
RAINFALL (INCHES) ACCUMULATED DURING
THE 30 DAYS PRIOR TO AUGUST 8



MAP 2
RAINFALL (INCHES) ACCUMULATED DURING
THE 60 DAYS PRIOR TO AUGUST 8



MAP 3
RAINFALL (INCHES) ACCUMULATED DURING
THE 90 DAYS PRIOR TO AUGUST 8

EVALUATION OF A MAP SHOWING THE CHANGE IN THE AVAILABILITY OF GREEN FORAGE

The attached map for an area in North Central Texas shows the increase or decrease in green forage (grass + forbs) in pounds per acre from June 15 to August 8, 1975. Negative numbers (and dashed lines) mean less green vegetation in August than June. Positive numbers (and solid lines) mean more green vegetation in August than June. 0 indicates no change. The map shows an area approximately 150 miles long and 150 miles wide. Please evaluate the map as if it were current information and complete the questions below. Your response will help us determine the value of this type of information to you and other ranchers in West Texas.

NAME _____

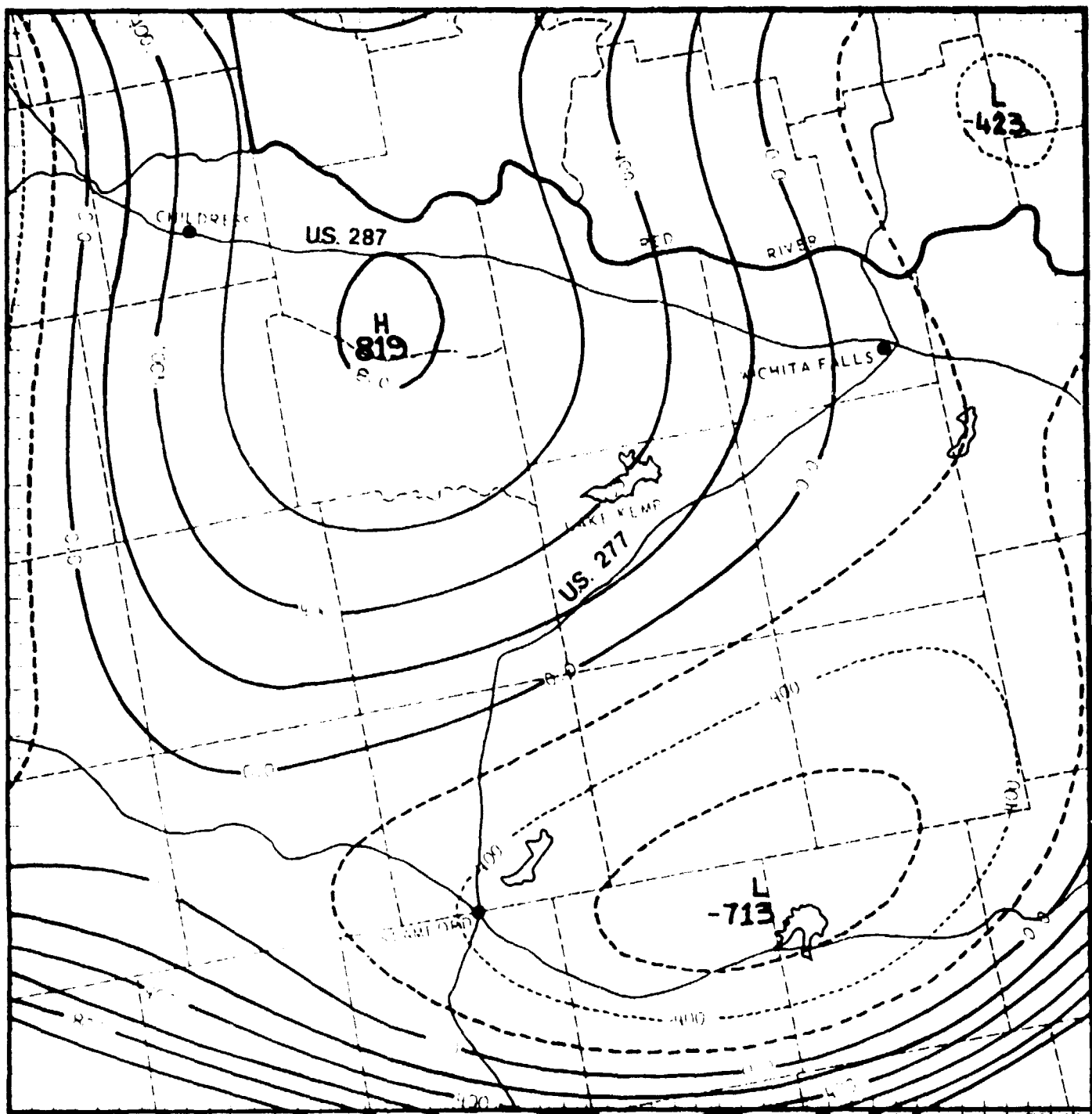
ADDRESS _____

TYPE OF OPERATION _____ SIZE (ACRES) _____

1. Is the location of your operation covered by the attached map? Yes _____ No _____
If yes, are there sufficient landmarks (highways, lakes, towns) on the map for you to locate your general area? Yes _____ No _____
If the landmarks are insufficient, what others should be added? _____
2. If your ranch location is not shown on this map, would a map of the same format and accuracy covering your operation be valuable?
Yes _____ No _____
3. Is the information on the availability of green forage understandable?
Highly Understandable _____ Moderately Understandable _____ Slightly Understandable _____ Not Understandable _____
4. Can you determine the amount of green forage produced from June to August in a specific area?
Very Easy _____ Moderately Easy _____ Easy _____ Not at all _____
5. Using the data on this map, approximately how much change in green forage was there immediately south of Lake Kemp?
_____ 0 lbs/acre (no change)
_____ 200-400 lbs/acre more _____ 200-400 lbs/acre less
_____ 400-600 lbs/acre more _____ 400-600 lbs/acre less
6. What improvements should be made to the green forage map to improve the value or clarity? (you may check more than one)
More landmarks _____ More detailed vegetation information _____ Reduce area of coverage _____
Enlarge area of coverage _____ Other (please specify) _____
7. How often would you like to have similar vegetation information?
Weekly _____ Biweekly _____ Monthly _____ Quarterly _____ Annually _____
8. Where would you like to see this information?
Newspaper _____ TV _____ Direct mail on subscription basis _____ Magazines _____ Other (please specify) _____

9. How valuable would information like this be to you in managing your operation?
Very Valuable _____ Moderately Valuable _____ Slightly Valuable _____ Not Valuable _____

Thank you for your assistance. The map is yours to keep. Please place the completed questionnaire in the enclosed self addressed postage paid envelope and place in the mail. You will be receiving a copy of the final report in a few weeks.



**CHANGE IN GREEN FORAGE IN POUNDS
PER ACRE FROM JUNE 15 TO AUGUST 8**

Regional Vegetation Type Map

The attached is a prototype regional vegetation type map developed at Texas A&M University for an area in north Central Texas. The area covered by the map is approximately 98 miles by 112 miles. A classification by manual image interpretation has been done on a Landsat image from October, 1973. Similar classification can be done and a product generated for almost any area at a variety of scales on a regular interval.

Please review the information presented on the map and legend and evaluate the contents in terms of the value of such a map for your region to your particular business.

You may keep the map. Please complete the product evaluation form, tear on the dotted line and return in the enclosed envelope.

Name _____ Address _____

Type of business _____

Is your area of interest covered by this map? yes _____ no _____

If yes, is your area of interest identifiable?

easily identifiable _____ identifiable _____ not identifiable _____

If your area is not covered by this map would a similar map covering your area be of value? yes _____ no _____

Are sufficient geographic features (lakes, towns, roads, etc.) shown for specific reference? yes _____ no _____

If no, what other features would you suggest?

For your area, how valuable would a vegetation type map be to you?

extremely valuable _____ moderately valuable _____ valuable _____ no value _____

If map from vegetation type information is valuable to you, where would you like to have it available?

- a. sent directly to your business address _____
- b. County SCS Office _____
- c. County Extension Agent _____
- d. Regional Experiment Station _____
- e. other (specify) _____

Would you be willing to pay at least \$10 for a map of this type covering your area(s) of interest? yes _____ no _____

Media Evaluation of Green Forage Map

The attached contour map for an area in North Central Texas was developed from satellite information to show the change in green forage from June 15 to August 8, 1975.

Please evaluate the attached map and narrative as if they were current information and complete the appropriate questions below. Your response will help us to determine the value of this data to the media in Texas. If this type of data proves valuable, it could be made available every 9 days depending upon cloud cover. If clouds prevented satellite picture acquisition, then the next available period would be 9 days later.

Name _____ Address _____

Media type _____

Map

1. Is the location of your service area covered by the enclosed map?

yes _____ no _____

If "yes", are there sufficient landmarks (highways, lakes, towns, etc.) on the map for it to be of value to your audience? yes _____ no _____

If landmarks are insufficient, what others should be added?

If your service area is not covered, would a map of the same format and accuracy be of value to your audience? yes _____ no _____

2. Is forage information on the maps understandable?

Highly understandable _____ Moderately understandable _____

Slightly understandable _____ Not understandable _____

3. Can you determine green forage levels in a specific area?

Very easy _____ Moderately easy _____ Easy _____ Not at all _____

4. What improvements should be made to green forage maps to improve their value or clarity (you may check more than one)

More landmarks _____ More detailed information _____

Reduce area of coverage _____ Enlarge area of coverage _____

Other (specify) _____

Narrative

1. Is the narrative detailed enough? yes _____ no _____

2. Is the terminology in the narrative appropriate to your audience intelligence level?

Highly appropriate _____ Moderately appropriate _____

Slightly appropriate _____ Not at all _____

3. Is the length of copy sufficient? yes____ no____

If no, specify appropriate changes? _____

TV

Would you prefer to have a - color slide format map and written narrative ____ or a color video tape with voice over____ delivered to you?

Print Media

What would be the best map format for us to deliver to you?

8x10____ 5x7____ other(specify)_____

How would you prefer to receive this data?

1. Direct mail (map and narrative) from College Station ____
2. Pick up (map and narrative) from County Extension Agent with his local update ____
3. Have County Agent deliver map and narrative to you with his local update____
4. Other (specify)_____

Radio

Would you prefer receiving a tape recording of the narrative____or
do you prefer voicing your own material____?

Media Evaluation of Rainfall Map

The attached rainfall contour map for an area in North Central Texas was developed to show the total accumulated rainfall in inches for the 30 days prior to August 8, 1975.

Please evaluate the attached map and narrative as if they were current information and complete the appropriate questions below. Your response will help us to determine the value of this data to the media in Texas. If this type of data proves valuable, it could be made available every 9 days.

Name _____ Address _____

Media Type _____

Map

1. Is the location of your service area covered by the enclosed map?

yes _____ no _____

If "yes", are there sufficient landmarks (highways, lakes, towns, etc.) on the map for it to be of value to your audience? yes _____ no _____

If landmarks are insufficient, what others should be added?

If your service area is not covered, would a map of the same format and accuracy be of value to your audience? yes _____ no _____

2. Is rainfall information on the maps understandable?

Highly understandable _____ Moderately understandable _____

Slightly understandable _____ Not understandable _____

3. Can you determine rainfall received in a specific area?

very easy _____ moderately easy _____ easy _____ not at all _____

4. What improvements should be made to rainfall maps to improve their value or clarity (you may check more than one)?

More landmarks _____ More detailed information _____

Reduce area of coverage _____ Enlarge area of coverage _____

Other (specify) _____

Narrative

1. Is the narrative detailed enough? Yes____ no____
2. Is the terminology in the narrative appropriate to your audience intelligence level?

Highly appropriate____ Slightly appropriate____

Moderately appropriate____ Not appropriate____

3. Is the length of copy sufficient? yes____ no____

If no, specify appropriate changes_____

TV

Would you prefer to have a - color slide format map and written narrative____ or a color video tape with voice over____ delivered to you?

Print Media

What would be the best map format for us to deliver to you?

8x10____ 5x7____ other(specify)____

How would you prefer to receive this data?

1. Direct mail (map and narrative) from College Station____
2. Pick up (map and narrative) from County Extension Agent with his local update____
3. Have County Agent deliver map and narrative to you with his local update____
4. Other (specify)_____

Radio

Would you prefer receiving a tape recording of the narrative____ or do you prefer voicing your own material?